

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

Claims 1-41 (Cancelled).

42. (Currently Amended) A process for producing an epoxidized elastomeric polymer comprising:

feeding at least one elastomeric polymer containing ethylenic unsaturation to a mixing device;

feeding at least one hydrogen peroxide precursor selected from inorganic persalts, metal peroxides, and hydrogen peroxide adducts to said mixing device;

feeding at least one carboxylic acid or a derivative thereof to said mixing device;

feeding water to said mixing device;

mixing and reacting said at least one elastomeric polymer containing ethylenic unsaturations, with said at least one hydrogen peroxide precursor, and said at least one carboxylic acid or a derivative thereof, and said water, to obtain an epoxidized elastomeric polymer; and

discharging the resulting epoxidized elastomeric polymer from said mixing device,

wherein said process does not include the use of peracids or hydrogen peroxide.

43. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the mixing device is selected from:

open internal mixers; internal mixers, continuous mixers of the Ko-Kneader type; and co-rotating or counter-rotating twin-screw extruders.

44. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 43, wherein the mixing device is a co-rotating twin-screw extruder.

45. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the elastomeric polymer containing ethylenic unsaturation is fed to the mixing device in a solid form.

46. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the hydrogen peroxide precursor is fed to the mixing device in a solid form.

47. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein said process is carried out at a temperature of 15°C to 200°C.

48. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 47, wherein said process is carried out at a temperature of 50°C to 180°C.

49. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein said process is carried out for 10 seconds to 30 minutes.

50. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 49, wherein said process is carried out for 30 seconds to 20 minutes.

51. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the epoxidized elastomeric polymer contains less than 10 mol% of epoxy groups relative to the total number of moles of monomers present in the elastomeric polymer.

52. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 51, wherein the epoxidized elastomeric polymer contains 0.1 mol% to 5 mol% of epoxy groups relative to the total number of moles of monomers present in the elastomeric polymer.

53. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the elastomeric polymer containing ethylenic unsaturation is selected from diene homopolymers or copolymers having a glass transition temperature below 20°C.

54. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 53, wherein the elastomeric polymer containing ethylenic unsaturation is selected from: cis-1,4-polyisoprene, 3,4-polyisoprene, polybutadiene, optionally halogenated isoprene/isobutene copolymers, 1,3-butadiene/acrylonitrile copolymers, styrene/1,3-butadiene copolymers, styrene/isoprene/1,3-butadiene copolymers, styrene/1,3-butadiene/acrylonitrile copolymers, or mixtures thereof.

55. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the elastomeric polymer containing ethylenic unsaturation is selected from elastomeric polymers of one or more monoolefins with an olefinic comonomer and at least one diene, or derivatives thereof.

56. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 55, wherein the elastomeric polymer containing ethylenic unsaturation is selected from: ethylene/propylene/diene copolymers; polyisobutene; butyl rubbers; halobutyl rubbers; or mixtures thereof.

57. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the elastomeric polymer containing ethylenic unsaturation has an average molecular weight of 2000 to 1,000,000.

58. (Cancelled).

59. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the inorganic persalts are selected from:

boron compounds, perborates, said perborates being selected from: sodium perborate hexahydrate of the formula $\text{Na}_2[\text{B}(\text{O}_2)_2(\text{OH})_4] \cdot 6\text{H}_2\text{O}$ (also defined as sodium perborate tetrahydrate of the formula $\text{NaBO}_3 \cdot 4\text{H}_2\text{O}$); sodium peroxyborate tetrahydrate of the formula $\text{Na}_2\text{B}_2(\text{O}_2)_2[(\text{OH})_4] \cdot 4\text{H}_2\text{O}$ (also defined as sodium perborate trihydrate of the formula $\text{NaBO}_3 \cdot 3\text{H}_2\text{O}$); sodium peroxyborate of the formula $\text{Na}_2[\text{B}_2(\text{O}_2)_2[(\text{OH})_4] \cdot$

4H₂O (also defined as sodium perborate monohydrate of the formula NaBO₃ · H₂O); or mixtures thereof;

alkali metal percarbonates, sodium percarbonate (sodium carbonate peroxyhydrate); potassium percarbonate; rubidium percarbonate; cesium percarbonate; or mixtures thereof; and

persulfuric salts, sodium persulfate, potassium peroxymonosulfate (also defined as potassium monopersulfate); or mixtures thereof.

60. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the metal peroxides are selected from: lithium peroxide, sodium peroxide, magnesium peroxide, calcium peroxide, strontium peroxide, barium peroxide, zinc peroxide, or mixtures thereof.

61. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the hydrogen peroxide adducts are selected from: urea/hydrogen peroxide adduct, polyvinyl pyrrolidone/hydrogen peroxide adduct, or mixtures thereof.

62. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein a hydrogen peroxide precursor is added in an amount of 0.1 phr to 50 phr.

63. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 62, wherein the hydrogen peroxide precursor is added in an amount of 0.5 phr to 20 phr.

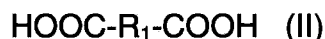
64. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the carboxylic acid is selected from monocarboxylic acids or dicarboxylic acids.

65. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 64, wherein the monocarboxylic acids have the following general formula (I):



wherein R represents a linear or branched C₁-C₁₂ alkyl group; a C₆-C₁₈ aryl group; a C₇-C₂₀ arylalkyl or alkylaryl group; or a C₅-C₁₈ cycloalkyl group.

66. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 64, wherein the dicarboxylic acids have the following general formula (II):



wherein R₁ represents a linear or branched C₁-C₁₂ alkylene group; a linear or branched C₂-C₁₂ alkenylene group; a C₆-C₁₈ arylene group; a C₇-C₂₀ alkylarylene or alkylenearylene group; or a C₆-C₂₀ cycloalkylene group.

67. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the carboxylic acid derivative is selected from esters, anhydrides, halides, imides, amides, or mixtures thereof.

68. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 67, wherein the carboxylic acid derivative is

selected from anhydrides, maleic anhydride, succinic anhydride, phthalic anhydride, or mixtures thereof.

69. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein the carboxylic acid or a derivative thereof is added in an amount of 0.1 phr to 50 phr.

70. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 69, wherein the carboxylic acid or a derivative thereof is added in an amount of 0.5 phr to 20 phr.

71. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein at least one non-ionic surfactant is added.

72. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 71, wherein the non-ionic surfactant is selected from those having a polyalkylene oxide polymer as a portion of the surfactant molecule, chlorine-, benzyl-, methyl-, ethyl-, propyl-, butyl-, and other like alkyl-capped polyethylene and/or polypropylene glycol ethers of fatty alcohols, polyalkylene oxide-free non-ionic, alkyl polyglycosides, polyol esters, sorbitan esters, sucrose esters, pentaerythritol esters and their ethoxylates, alkoxylated ethylene diamines, carboxylic acid esters, glycerol esters, polyoxyethylene esters, ethoxylated and glycol esters of fatty acids, carboxylic amides, ethoxylated amines and ether amines, or mixtures thereof.

73. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 71, wherein the non-ionic surfactant is selected from C₆-C₂₄ alcohol ethoxylates having from 1 to about 20 ethylene oxide groups; C₆-C₂₄ alkylphenol ethoxylates having from 1 to about 100 ethylene oxide groups; C₆-C₂₄ alkylpolyglycosides having from 1 to about 20 glycoside groups; C₆-C₂₄ fatty acid ester ethoxylates, propoxylates, or glycerides; C₄-C₂₄ mono or dialkanolamides; or mixtures thereof.

74. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 71, wherein the non-ionic surfactant is selected from alcohol alkoxyates, alcohol ethoxylate propoxylates, alcohol propoxylates, alcohol propoxylate ethoxylate propoxylates, alcohol ethoxylate butoxylates, or mixtures thereof; nonylphenol ethoxylate, polyoxyethylene glycol ethers, or mixtures thereof; polyalkylene oxide block copolymers, an ethylene oxide/propylene oxide block copolymer, or mixtures thereof.

75. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 71, wherein the non-ionic surfactant is added in an amount of 0 phr to 20 phr.

76. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 75, wherein the non-ionic surfactant is added in an amount of 0.1 phr to 10 phr.

77. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein at least one stabilizing agent is added.

78. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 77, wherein the stabilizing agent is selected from hindered phenols, sterically hindered amines, amine derivatives, dihydroquinoline derivatives, or mixtures thereof.

79. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 77, wherein the epoxy group stabilizing agent is added in an amount of 0 phr to 10 phr.

80. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 79, wherein the epoxy group stabilizing agent is added in an amount of 0.1 phr to 5 phr.

81. (Previously Presented) The process according to claim 42, wherein the water is added in an amount of 0.1 phr to 50 phr.

82. (Previously Presented) The process according to claim 81, wherein the water is added in an amount of 0.5 phr to 20 phr.

83. (Previously Presented) The process for producing an epoxidized elastomeric polymer according to claim 42, wherein said water is fed stepwise.